CLASSIFYING LAND for CONSERVATION FARMING

FARMERS' BULLETIN No. 1853
U. S. DEPARTMENT OF AGRICULTURE

EFFICIENT use of land is of first importance under wartime demands for food, oil, and fiber. Land-capability classes indicate the maximum intensity of use that can be practiced safely in a permanent system of farm management. They show the areas from which it is practicable to expect increased production with more intensive farming and those which in normal times should be in permanent vegetation but in times like the present emergency can be used for cropland. Also, they show the areas from which satisfactory yields of cultivated crops cannot be expected but from which we can get products that will mean more meat and more milk and cheese.

Land capability is being studied intensively by farmers and technicians in hundreds of soil conservation districts and other work units throughout the country. The land-capability classes are based on detailed surveys of soil types, slopes, and past erosion. They make full use of experience gained by users of the land, in classifying land and in recommending practices that will make possible its productive use, without deterioration, for a long period of time.

This bulletin tells how the classification has been devised and explains the principles back of it. It defines the eight land-capability classes and gives several pictorial examples of each. And it shows how the classification is used in selecting and applying soil-saving and soil-using practices on individual farms. Thus it gives, for the war emergency and afterward, a method of recognizing different kinds of lands and determining their most efficient use.

Washington, D. C.

Issued February 1943

CLASSIFYING LAND
for Conservation Farming

By R. D. HOCKENSMITH and J. G. STEELE, *senior soil scientists, Soil Conservation Surveys Division, Soil Conservation Service* [1]

CONTENTS

The Need for an Inventory

CONSERVATION FARMING is a necessity in time of war. Food and fiber must be produced in large amounts, despite shortages of labor and of farm machinery. Acreage of some crops, particularly peanuts and soybeans in 1942 and 1943, must be increased—and peanuts and soybeans are erosion-inducing crops. Increased production of meat and milk will require more grain, more hay, more silage, and better pastures. To meet these demands, every acre must be made to produce as much as possible of the needed crops for which it is suitable. It would be folly, however, to plow steep land or unproductive land for tilled crops, wasting precious labor and exposing the soil to ruinous erosion. On the other hand, many gently sloping, productive areas now in pasture or hay might well be planted to crops during this emergency. An understanding of land capability is the first step toward conservation farming and increased production.

We have plenty of good land in the United States, but not too much. Already two-thirds of the farms and ranches have been damaged to some extent by soil erosion. More than 50 million acres of former

[1] This bulletin was prepared under the supervision of E. A. Norton, Chief, Soil Conservation Surveys Division. The classification of land capability was outlined in NORTON, E. A. SOIL CONSERVATION SURVEY HANDBOOK. U. S. Dept. Agr. Misc. Pub. 352, 40 pp., illus. 1939. Further developments were discussed before the Soil Science Society of America in 1939 and at the National Conference on Land Classification held at Columbia, Mo., in 1940. See NORTON, E. A. CLASSES OF LAND ACCORDING TO USE CAPABILITY. Soil Sci. Soc. Amer. Proc. (1939) 4: 378–381; and LAND CLASSIFICATION AS AN AID IN SOIL CONSERVATION OPERATIONS. *In* The Classification of Land. Mo. Agr. Expt. Sta. Bul. 421, pp. 293–313. 1940.

cropland have been ruined for immediate cultivation, another 50 million acres have been seriously damaged, and still another 100 million acres have lost half or more of the original fertile topsoil. At present there are about 415 million acres used for crops, of which at least 73 million acres are too steep, too severely eroded, or otherwise unsuitable for cultivation. There is also a limited amount, perhaps 70 million acres, of undeveloped land, but it must be cleared, drained, or irrigated before it can be placed in production. These general estimates are based on the best information available but are subject to refinement and correction as better surveys are made. General estimates, however, are of little value in selecting and applying the methods needed on an individual farm.

For increased production we must look chiefly to the land now in farms. There are many farms on which some fields are not being used with full efficiency. Idle fields, capable of producing crops, pay no return to the farmer and may be damaged by erosion unless they have protective cover. All land is good for something, but many areas of wet, steep, stony, shallow, or sandy land are not well suited for the ordinary crops.

The land-capability classes defined in this bulletin indicate in a general way the use for which the land is best suited. Shown by symbols or colors on a map they locate land that can safely and profitably be cultivated and is now in some other use. Equally important, they locate the millions of acres now in cultivation that would give more profitable returns if put in trees or grass. The land-capability classification is based on a physical inventory of the area, field by field and farm by farm. The physical facts recorded in the inventory are soil types, slopes, and erosion. These facts considered in relation to the rainfall, growing season, and other climatic factors determine the land capability.

Farmers and ranchers, with the help of trained technicians, are devising and applying good practices on their land in several hundred soil conservation districts that include more than 439 million acres (October 1942). The methods worked out there for saving soil and increasing production can be extended rapidly to other lands.

Local landowners and operators organize a district, and a board of elected farmer supervisors governs it. Forty-two States (in October 1942) had passed laws making possible the organization of these self-governed districts. The supervisors, after a district is organized, decide on a plan of work. They may, if they desire, request technical assistance from the United States Department of Agriculture or from other agencies.

One of the first steps in assisting a district is the taking of a physical land inventory to furnish facts for the land-capability classification. Making this inventory is a technical job of field mapping, because it requires familiarity with the systems of classification and practice in distinguishing the different soils, slope classes, and kinds and degrees of erosion. The next step is to classify the land. In setting up the classification full use is made of the knowledge gained by practical farmers as well as that obtained from experiments. After the classes are set up they are shown on the map by symbols or by colors.

Land Misuse is Wasteful

MISUSE OF LAND costs money. If it makes the soil liable to erosion by water or wind, the loss is immediate and permanent although sometimes so gradual it is scarcely noticed. If the misuse is merely failure to grow crops on the most suitable land, the farmer at the best obtains less than the maximum returns for his labor, seed, and fertilizer. Such waste can be prevented by farming according to land capability, using practices that have been tested and proved by practical farmers and by the experiment stations. This amounts to a form of selective service for farm land whereby each acre is put to the use for which it is best fitted. To carry out such a selective-service plan, the farmer needs some help in classifying his land and in putting it to work for maximum production, protection, and profit.

The land shown in figure 1, which was formerly some of the best in the Central States, has been seriously and irreparably injured by water erosion. Running water caused sheet erosion and deep gullying. Many acres that only a few years ago were productive cropland now afford only scant pasture between the gullies. This reduces the value of the farm as property and deprives the Nation of land that properly cared for would now be producing crops needed so badly for the war efforts. These farms are not yet ruined, but the deep gullies can never be wholly reclaimed, and the remedies must be immediate and drastic if the land is to be saved.

Neb–1094

***Figure 1.*—Branching gullies on these Nebraska farms show an advanced stage of erosion. Farming methods should be changed to fit the contour of the land.**

Tex-2535

Figure 2.—Severe wind erosion.

Wind erosion in semiarid regions attacks more swiftly than water erosion. It may take a whole field to plow depth in a single season. The soil is picked up and sorted. Fine particles are carried for long distances, sometimes hundreds of miles, and coarser sands or granulated soils are laid down in drifts nearby. The moving soil not only covers and smothers growing crops and grasses but cuts them with a sand-blast effect. An entire crop of wheat may be ruined in a few days.

Figure 2 shows wheatland on which the crops have failed for several years because the rainfall was not retained on the land where it fell. Instead, most of it ran off, thus permitting not only waste of water, which is scarce, but also causing damage by gullying fields and flooding bottom lands along stream channels. High winds have removed most of the unprotected topsoil and have formed drifts that must be leveled before another crop can be planted.

Removal of topsoil by water or wind is for the most part an unnecessary, preventable waste. The upper subsoil that is exposed by complete erosion of the surface layer is nearly always less productive than the original soil. Sometimes it can be built up to be fairly productive, but more often it cannot. Measurements at Fowler, Ind., in 1940 showed that average corn yields were 31.6 bushels per acre where the topsoil was less than 2 inches deep, but 59 to 69 bushels per acre where it was 9 inches or more deep.

But few, if any, land operators have ever willfully destroyed or injured their land. To the early settlers forests were barriers that had to be removed before the crops so necessary for subsistence and for trade could be grown. Prairie sod had to be broken to furnish food and, indeed, to obtain title to the land under the homestead laws. Moreover, the rectangular land survey used in most of the States led

naturally to farming along field or fence lines rather than on the contour. And farmers everywhere took pride in straight rows, even if the rows ran downhill and served as channels for water that washed a little deeper and wider with each rain. Pride in the ability to plow a straight row slowed up general acceptance of contour farming on the early soil conservation demonstrations, when the best farmers feared that they would be ridiculed if their rows ran on the level around the hill.

Conservation Farming: A Basis for Permanent Agriculture

CONSERVATION became a national watchword early in the twentieth century, but the need for conservation farming was not fully understood, even by many of our agricultural leaders and scientists, until the middle or late 1930's. Only the merest beginning has yet been made on the real job of conservation farming—of making part of the farmers' routine all the practices necessary to preserve, improve, and make good use of the soil. Conservation farming must become an everyday part of the whole job of making a living from the land. Until this is accomplished, soil depletion will continue to threaten one of our most valuable resources, the very substance of the land.

Conservation farming as a rule is not difficult. If carried on year after year, it gives better yields on an average than the older wasteful methods. At Bethany, Mo., in 1940 on 7.5-percent slope the yield of corn was 70.5 bushels per acre under conservation farming, on a field that had been limed, fertilized, and manured, when corn followed clover and cultivation was on the contour. The yield was only 32.6 bushels per acre on a similar field that received no lime, fertilizer, or manure, when corn followed corn and cultivation was up and down the slope.

To bring about conservation farming, however, the farmer or rancher must make efficient use of every acre. To do this he needs not only an inventory of his land and its capability but also the help of a skilled and experienced farm-planning technician, who can furnish suggestions and help in installing measures that will save and build up the soil. The entire farm must be considered; seldom, if ever, will a single practice do the job, no matter how well it is carried out.

Fortunately there are now good examples of conservation farming in nearly every part of the country; and, more and more, farmers are adopting the soil-saving and soil-using practices that will increase yields and keep their land productive. Good farmers have been following many of the practices of conservation farming for years, but few have been doing a complete job. On sloping farms a trained soil conservation technician ordinarily can recommend a dozen or more practices for better farming. Contour farming, contour strip cropping, and water control are some of the practices still needed on most sloping farm land.

Conservation-farming methods have been demonstrated by farmers in soil conservation projects and in work areas of the Civilian Con-

servation Corps since 1934. For nearly 4 years most of the work was in small demonstration areas where only a few farmers could be assisted. Since 1938, work has been chiefly in the form of assistance to locally organized soil conservation districts.

Farmers in districts or other work units receive technical help in drawing up farm-conservation plans. To make a complete farm plan, two sets of facts are needed. One is the inventory of the land, which is most conveniently recorded on a map. The other is some facts about the farm business, which must be clearly understood by both the farm-planning technician and the farmer. On range lands an inventory of forage resources is considered a third set of facts necessary in making the plans for a ranch.

Soil conservation technicians soon discovered that the inventory, to be useful in planning conservation farming, must be more than a soil map, an erosion map, or a slope map; and yet it must be simpler than any of them. It must not be based on the present land use, which may be incorrect, but it must be easily compared with the present use to show clearly the adjustments that are needed. It must be detailed, to allow separate treatments field by field or acre by acre if necessary, but it must be simple and easy to interpret. It was in response to these needs that the method of classifying land capability developed.

Classifying Land Capability

LAND CAPABILITY is the suitability of land for a specified use. Farm land as a rule is used either for the production of crops, which requires tillage, or for some form of permanent vegetation (usually grass, other forage plants, or timber) which requires little or no tillage. In classifying land capability, answers to these questions are first sought: Is the land suitable for the production of crops? Can it be used safely for tillage without soil erosion? Is its safe and permanent use limited to the production of permanent vegetation? Some land, of course, is intermediate and can be safely used for occasional cropping such as a grain crop every few years to establish hay or, in a semiarid climate, for limited cropping such as growing feed crops on a small part of the total land in a given area. And some other land is so rocky, steep, or barren that it does not produce any significant amount of useful vegetation.

Probably every farmer has made in his own mind some kind of classification of the capability of his land. He knows that some fields can be used for cultivated crops and that others are too steep, too stony, too thin, or too wet, for cropping. He knows that some of his fields not suitable for cultivation make good pasture and that still others are most productive if managed as farm woodland. In a general way he knows these outstanding facts about his land although probably he has never made a map of his farm nor even expressed all of these ideas in words.

Most farmers, however, have failed to realize fully that sloping land cannot be farmed safely by level-land methods. They have plowed straight furrows and planted straight rows rather than change

their farming to fit the land. This makes some of the rows run uphill and downhill, and every rain falling on an unprotected surface removes part of the soil. A few farmers, watching muddy water flow from their fields, have appreciated how valuable and how irreplaceable their thin layer of topsoil really is and have taken steps to check this kind of waste. But losses of soil for the most part come about so gradually that they are not fully realized. Farming habits, like any others, are difficult to change; moreover, precise recommendations for soil-saving measures have not been generally available to farmers. Therefore, it is not surprising that in the past the farmer in classifying his land for use more often than not has neglected to consider the full significance of soil erosion.

Use and conservation of land are influenced by the nature of the soil, the degree to which it has been affected by erosion, the slope, and the climate. Some of the soil factors are texture, granulation, depth, stoniness, acidity, saltiness, and the supply of plant nutrients. The climate must be considered because it affects the crops that can be grown and the density of vegetation, both of which help to determine the need for and the possibility of erosion control.

Any one of the factors just named, or several of them together, may limit the possible use of land. The rate of soil erosion depends on several soil properties, vegetal cover, climate, and steepness of slope. On some soils erodibility on critical slopes is the deciding factor in setting up classes of land suitable for cultivation. On others, the combined influence of a high water table and low fertility might be dominant. Just as a chain is no stronger than its weakest link, a soil that is productive but steep and erodible or one that is level and easily worked but extremely infertile should not be depended upon for cropland. These lands are not suitable for crops. They may be suitable for permanent vegetation that can be used for grazing or timber in humid areas or for grazing where there is not enough rain to grow trees.

Figure 3.—A soil surveyor studying the soil brought up on an auger to determine the color and texture of the subsoil. He also studies soil layers in road cuts and excavations.

Figure 4.—**A soil surveyor recording type of soil, slope of the land, and kind and degree of soil erosion, on an aerial photograph.**

Soon after a soil conservation district is formed, many farmers will see a soil surveyor walking briskly across their fields. He carries an auger with a T-shaped handle, and every few minutes he pauses and bores in the soil (fig. 3). Sometimes he merely looks at the surface soil and then at the subsoil that clings to the auger, rubbing some of it between his thumb and finger, reflecting a moment, and writing something on a paper clipped to a board. Then he takes a small instrument from his pocket or belt and sights through it, looking directly up or down the slope. Occasionally he bores a deep hole, studying each augerful of earth intently. He glances around, evidently observing the entire landscape, then sketches for a few moments and moves on. He crosses farm boundaries and doesn't appear to be taking any special notice of them. He is preoccupied all the time, as if he were counting steps and making mental notes between stops. If he is questioned, he explains exactly what he is doing.

The soil surveyor is carrying a base map which is an aerial photograph large enough to show every road, woodland, and field. He is watching the color, texture, appearance, and feel of the soil—and in so doing he is identifying the soil type. His frequent shallow borings enable him to determine the depth of topsoil and subsoil and to estimate the amount of soil that has been lost through erosion. The small instrument he sights through is a hand level, used to estimate the slope. He puts what he finds about the soil, slope, and erosion on the aerial photograph and draws boundary lines to show how far each particular condition extends (fig. 4). Then he indicates whether the land is in crops, woods, pasture, or some other use. He is making what has come to be called a soil conservation survey.

The next step is to make use of the knowledge accumulated by users of the land. A committee composed of farmers, the county agricultural agent, teachers of agriculture, State experiment station and extension workers, members of county land use planning committees,

soil conservation technicians, and any others who can contribute either technical skill or practical experience, makes a careful study of the physical facts shown on the map. This job is done largely around a conference table within the area for which the classification is being developed. They consider carefully all the information, published or unpublished, that can be obtained from experiments and demonstrations. Field trips to certain farms are sometimes made by the committee to examine the factors mapped, in order that all concerned may have a uniform understanding of the physical conditions involved. If the area lies within an organized soil conservation district, the district supervisors usually take the lead in this analysis. A classification of land is developed which shows by means of eight (or fewer) classes the suitability of land in the district for cultivation and for other forms of use.

The committee discusses each soil type, its fertility, its susceptibility to erosion, its behavior on different slopes, and its changes as erosion becomes more severe. Each combination of slope and erosion classes mapped on each soil type is considered and finally assigned to one of the eight classes. Some differences of opinion arise during the discussion as to the use that might be made of certain soils, or slopes, or degrees of erosion, but the classification is gradually worked out according to the best information that can be had. Full use is made of information from demonstrations and from research studies. Experience of farmers is the surest guide. The information, when it is completed, is assembled in a table similar to table 1.

Table 1 contains the names of soil types in the different soil groups, and the symbols denoting slope classes and erosion classes. This is a technical presentation, but it is the only way in which the information can be assembled by exact methods. After such a table has been worked out, shorter descriptive names can be written for the land in the different groups. The table shows, for example, that class I consists entirely of nearly level, well-drained soils. Class II consists of two rather distinct kinds of land: Gently sloping, well-drained soils; and nearly level, imperfectly drained soils in which movement of water is slow because of a tough or plastic subsoil. Class III consists of well-drained soils that are sloping or eroded, and imperfectly drained soils that are gently sloping and slightly or moderately eroded.

The eight land-capability classes are described as follows:

Suitable for cultivation with:

- I. No special practices.
- II. Simple practices.
- III. Intensive practices.

Suitable for occasional or limited cultivation with:

- IV. Limited use and intensive practices.

Not suitable for cultivation but suitable for permanent vegetation with:

- V. No special restrictions or special practices.
- VI. Moderate restrictions in use.
- VII. Severe restrictions in use.

Not suitable for cultivation, grazing, or forestry:

- VIII. Ordinarily, extremely rough, sandy, wet, or arid land not suitable for cultivation, grazing, or forestry, but land that may have value for wildlife.

TABLE 1.—*Soil types, slope classes, and erosion classes making up each land-capability class in the Abbeville County Soil Conservation District, South Carolina*

Soil group and type	Slope[1] and degree of erosion[2] characterizing land-capability class— I (green)[3]	II (yellow)[3]	III (red)[3]	IV (blue)[3]	V (dark green)[3]	VII (brown)[3]
1. Well-drained soils on first bottoms and colluvial slopes.	A, B: +					
2. Well-drained loams to clay loams:						
Davidson and Mecklenburg loams.	A: 0, 1	A: 17, 2, 27 B: 0, 1, 2.	A: 1⑦, 17 V, 18, 2⑦, 27 V, 28 B: 1⑦, 17 V, 18, 27, 2⑦, 27 V C: 0, 1, 17, 1⑦, 17 V, 2, 27.	C: 27 V, 18, 28 D: 0, 1, 17, 1⑦, 17 V, 18, 2, 27, 2⑦, 27 V, 28.		A, B, C, D: 1⑧, 18 V, 2⑧. All E and F slopes.
Cecil, Davidson, Lloyd, and Mecklenburg clay loams, Georgeville silty clay loam.			A, B: 3, 37, 3⑦ C: 3, 37.	A, B: 37 V, 38. C: 3⑦, 37 V, 38. D: 3, 37, 3⑦.		A: 3⑧, 38 V, 4, 5, 9. B, C: 3⑧, 38 V, 4, 47, 5, 9. D: 37 V, 38, 3⑧. 38 V, 4, 5, 9. All E and F slopes.
Davidson and Cecil clays				A, B: 4, 47 C: 4.		A, B: 4⑦, 47 V, 48, 48 V, 5, 9. C: 47, 4⑦, 47 V, 48, 48 V, 5, 9. All D, E, and F slopes.
3. Well-drained sandy loams. Appling, Cecil, Durham, Georgeville, Lloyd, and Wickham sandy loams.	A: 0, 1	A: 17, 2, 27 B: 0, 1, 17, 2.	A: 1⑦, 17 V, 18, 2⑦, 27 V, 28 B: 1⑦, 17 V, 18, 27, 2⑦, 27 V, 28, 3, 37. C: 0, 1, 17, 1⑦, 17 V, 2, 27.	C: 18, 2⑦, 27 V, 28, 3, 37 D: 0, 1, 17, 1⑦, 17 V, 2, 27, 2⑦, 27 V.		A, B, C: 1⑧, 18 V, 2⑧, 28 V. D: 18, 1⑧, 18 V, 28, 2⑧, 28 V. All E and F slopes.
4. Imperfectly drained soils with moderately friable subsoils: Colfax sandy loam.				A, B: +, 0, 1, 17, 1⑦, 2, 27, 2⑦.		A: 18, 1⑧, 18 V, 28, 2⑧, 28 V. B: 17 V, 18, 1⑧, 18 V, 27 V. All C, D, E, and F slopes.
5. Imperfectly drained soils with plastic, tough, subsoils: Enon and Helena sandy loams, Iredell loam.		A: 0, 1, 17, 2, 27	A: 1⑦, 17 V, 2⑦ B: 0, 1, 17, 1⑦, 17 V, 2, 27, 2⑦. C: 0, 1, 17, 1⑦, 2, 27.	A, B: 18, 27 V, 28 C: 18, 2⑦. D: 0, 1, 17, 1⑦, 2.		A, B: 1⑧, 18 V, 2⑧, 28 V. C: 1⑧, 18 V, 28, 2⑧, 28 V. D: 17 V, 18, 1⑧, 18 V, 2⑦. All E and F slopes.
Orange silt loam				A, B: 0, 1, 17, 2, 27		A, B: 1⑦, 18, 1⑧, 2⑦, 28. All C, D, E, and F slopes.
Enon and Iredell clay loams						All classifications.
6. Soils with little development. Goldston silt loam, Louisburg and Wilkes sandy loams.				A, B, C: 0, 1. 17, 2, 27 D: 0, 1, 2.		All A, B, C, and D slopes not in class IV. All E and F slopes.
7. Poorly drained soils: Worsham sandy loam				A: +, 0, 1, 17, 1⑦, 18, 2, 27, 2⑦, 28. B: +, 0, 1, 17, 1⑦, 18, 2, 2⑦.		A: 1⑧, 18 V, 2⑧, 28 V. B: 17 V, 1⑧, 18 V, 27 V, 28. All C, D, E, and F slopes.
Alluvial soils poorly drained					A: +	

[1] Slope symbols: On Cecil, Appling, Durham, Davidson, Lloyd, and Georgeville soils: A, less than 2 percent; B, 2–6; C, 6–10; D, 10–15; E, 15–25; and F, 25 or more. On other soils: A, less than 2 percent; B, 2–4; C, 4–7; D, 7–10; E, 10–15; and F, 15 or more.

[2] Erosion symbols: 1, 2, 3, 4, and 5 indicate progressive degrees of sheet erosion; 7, 8, and 9, occasional, frequent, and very frequent or large gullies, respectively; ○, gullies too deep to be crossed by tillage implements; V, gullies that have penetrated into friable parent material; 0, no apparent erosion; and +, recent alluvial and colluvial deposits. Combined symbols, as 17, indicate sheet erosion and gullying.

[3] Color distinguishing class area on land-capability maps.

Land Suitable for Cultivation

Land suitable for cultivation is placed in classes I, II, and III. All such land must be workable, that is, deep enough, and sufficiently free from stones for cultivation. It must be productive enough, considering climate as well as soil, to give at least moderate yields of some of the common crops. Wet land must be drained, or drainable, and suitable for cultivation after drainage. Bottom land must be sufficiently free from overflow to make cultivation practicable. Land in arid regions must be suitable for cultivation under irrigation and in addition must have water available. The factors on which classes I, II, and III are differentiated from each other are those affecting the entire set of practices and measures necessary for safe, long-time cultivation. The principal factors are erodibility, slope, natural drainage, permeability, liability to overflow, and in a few instances natural fertility. Additional factors such as salinity affect the differentiation of classes I, II, and III in an irrigated area. No attempt is made, however, to classify water rights on individual tracts within an irrigation district as part of the land-capability classification.

CLASS I

Class I land is suitable for cultivation without special practices. In common with land in classes II and III, it must be workable and at least moderately productive. Furthermore, it must be nearly level; not subject to more than slight erosion regardless of treatment; free from overflows that interfere with planting, growing, or harvesting crops; and well enough drained, either naturally or artificially, to permit at least moderate yields of ordinary crops. If land is artificially drained, the system must be one that can be maintained without special practices other than those that can be carried on in ordinary farm operations. Irrigated land must be level enough to be irrigated without special practices, ordinarily having less than 1-percent slope, and must have good permeability.

Land in class I, in common with land in classes II and III, may require replenishment of the nutrient elements that are removed in crops and lost by leaching and also tillage practices to maintain good soil structure, crop rotations to control diseases or pests or to give increased yields, or green-manure crops to replenish organic matter. The ordinary application of any or all of these practices is commonly required for good use of class I land. The need for unusual or especially intensive application of any one of them in order to obtain moderate yields, however, would cause the land to be placed in another class.

Class I land is frequently, but not necessarily, the most productive cropland, and it is usually the most desirable cropland, because special practices are not needed.

Class I land in an irrigated area is shown in figure 5. This land can be cultivated permanently and safely and will produce moderate to high yields of sugar beets, corn, beans, and other adapted farm crops. It is assumed that the commonly recognized good farming and irrigation practices will be used.

Class I land in South Carolina and in Illinois is shown in figures 6, 7, and 8.

Colo–190

Figure 5.—Class I land in an irrigated area in Colorado.

SC–569

Figure 6.—Class I land in South Carolina. This land is nearly level, permitting use of straight rows without any danger of erosion. The crop is tobacco, which requires good management and heavy fertilization.

Ill–1573

Figure 7.—Class I land in Illinois. This highly productive well-drained nearly level land can be cultivated safely and permanently without special practices.

SC–D8–2

Figure 8.—Class I land in South Carolina, suitable for cotton and other intertilled crops without the need of special practices to protect the land from erosion. The soil is Magnolia fine sandy loam, the slope is less than 1 percent, and there is no appreciable erosion.

CLASS II

Class II land is suitable for permanent cultivation with simple practices. The chief types of practices needed are likely to be (1) erosion control, (2) water conservation, (3) simple drainage, (4) simple irrigation, (5) removal of stones or other obstacles, or (6) correction of moderately low fertility by fertilizers or soil amendments. The erosion-control and moisture-conservation practices most commonly used on class II land are contour tillage, strip cropping, cover crops, crop rotations that include grasses or legumes, simple terrace systems, rough tillage, stubble mulch, or basin listing. It is impossible however, to classify these or any other single practice as simple or intensive, since the intensity or the difficulty of application may be fully as important as the nature of the practice. The application of strip cropping and suitable crop rotations may be judged a simple set of practices on a 7-percent slope and an intensive set of practices on a 12-percent slope. Terracing and establishing suitable outlets are usually considered intensive practices, but some land needing terracing is classified as II. Local determination must be made of what are simple and intensive practices or sets of practices, and the classification that is arrived at must always be one that is practicable and useful.

Examples of class II land and of the practices that must be applied to use it permanently are illustrated in figures 9 to 13. These pictures do not show all of the different kinds of class II lands or all remedial practices, but they give typical examples of each.

Cal-4913

***Figure 9.*—Class II irrigated land in California on a 5-percent slope that requires simple precautionary measures to prevent the waste of soil and water. Severe erosion has been caused by a recent moderate rain. Irrigation water running down the furrows also contributes to soil losses. The practices recommended for this field are: Establishment of annual winter cover crop before the rainy season, basin listing on the contour, and planting and irrigating the new orchard approximately on the contour.**

Ia–1138; Wn–10120; NC–D7–35

Figure 10.—*A*, Strips of wheat and corn between buffer strips of alfalfa on class II land in Iowa. Strip cropping on the contour and good crop rotation will protect the soil in this field. *B*, Class II land near Walla Walla, Wash. It is suitable for cropping if simple practices are used, including contour tillage, stubble mulch, rough open tillage, and a rotation of wheat, summer fallow or spring wheat, and peas. This field is Walla Walla fine sandy loam on a moderately eroded 8-percent slope. *C*, Class II land in North Carolina on a 2-percent slope that is severely eroded. The soil is Mecklenburg loam. Simple practices including strip cropping and contour tillage are necessary to halt erosion on this land.

485916°—43——3

Tex-50165; Ill-1225; NM-11652

Figure 11.—*A*, Contour strip cropping on class II land in the Blackland of Texas. *B*, Class II land in Illinois on a gentle slope. Corn is being planted in furrows on the contour. Each forrow is a low dam checking runoff down the slope. *C*, Class II land in an irrigated valley in New Mexico. A simple drainage system must be maintained on this level Gila loam soil to protect the land from a high water table.

Wis–376

Figure 12.—Class II land in the western part of Wisconsin on a 5-percent slope. The soil is Tama silt loam that has lost nearly half of its topsoil because of former improper farming methods. This land is now being farmed safely by the use of strip cropping and cultivating on the contour, practices that will control erosion on this land.

Tex–7732

Figure 13.—Class II land in the Texas Panhandle. This land has soil and slope conditions that are responsive to simple conservation treatment such as terracing and farming on the contour. In the Great Plains region inches of rainfall are ordinarily not nearly so important to crops as inches of moisture in the soil. By stopping surface runoff, more moisture is made available for crops. In this field, water is backed up from one level terrace (closed at the ends) to the other.

CLASS III

Class III land is suitable for permanent cultivation with intensive practices. It is land requiring careful and intensive application of the best possible practices for soil-erosion control or soil management. The types of practices needed, some of which are the same as those for class II land, are (1) erosion control, (2) water conservation, (3) drainage, (4) intensive irrigation practices, (5) removal of especially large or numerous stones, (6) correction of low fertility by fertilizers or soil amendments. If the soil is workable and productive but on slopes so steep that erosion control is imperative, several practices will be needed. These may include long crop rotations, strip cropping in narrow strips, terraces and outlets, buffer strips, diversion ditches, waterways, contour tillage, cover crops, stubble mulch, rough tillage, or basin listing. Drainage systems or irrigation systems needed may be more difficult to install or may require more active maintenance than on class II land, or the land when drained or irrigated may also require additional soil treatments to give moderate or high yields.

Usually a combination of several practices is required for safe and permanent cultivation of class III land. A higher degree of skill in management is needed than on class II land. Examples of class III land in several different regions, and of the practices that are effective on these sites, are shown in figures 14 to 23. Nine of these pictures are of land that must have intensive protection against water erosion. Figure 18 shows land that must be protected against wind erosion also. The practices for wind-erosion control are the same as those recommended for class II land, contour farming, strip cropping, use of crop residues and stubble mulch, rough tillage, and terraces where they can be used effectively. These practices must be applied intensively to prevent soil drifting. Figure 22 shows some

Wis-38

***Figure 14.*—Class III land on a 12-percent slope in Wisconsin that is being protected by a combination of terracing and strip cropping. One terrace is visible in the middle of the grain strip and one in the alfalfa strip above.**

Cal-4089

Figure 15.—Class III irrigated land in California on a 12-percent slope that is moderately eroded. This irrigated orchard should be protected from future damage by annual cover crops along with contour cultivation, annual grade ditches, and buffer strips. Proper irrigation practices and application of nitrogenous fertilizer are also essential.

SC-50039

Figure 16.—Class III land in South Carolina on a slope of nearly 10 percent. This land requires intensive erosion-control measures, including terraces and vegetated outlets for water disposal. A meadow strip has been established in a natural waterway to be used as an outlet for terraces and for drainage from crop rows. It will also furnish a crop of hay.

Ill-529

Figure 17.—Erosion in a soybean field in Illinois on class III land. Special practices—same as for class II land—such as contour farming, strip cropping, crop rotations, and terracing must be applied intensively to protect this land.

Figure 18.—A deep, sandy soil in western Texas farmed with cotton in straight rows without strip cropping or moisture-conservation practices. Failure to make rigid application of conservation practices is resulting in serious soil drifting. Though this soil was deep and fertile, special practices for water conservation and wind-erosion control are necessary to preserve the soil and maintain permanent production of moderate yields. This class III land needs much greater intensity of treatment and more careful management than class II land. Practices such as contour tillage, strip cropping, maintenance of adequate crop residues, and special attention to height of stubble are necessary to protect the land for safe use.

Tex-17825

Tex-40203

Figure 19.—Class III land in the Black Belt of Texas. The soil is Houston black clay on a 4-percent slope. The conservation practices protecting this land are contour cultivation, strip cropping, terracing with protected outlets, green manuring, and a crop rotation that includes close-growing crops.

Figure 20.—Class III land near Pomeroy, Wash., on a 12-percent slope that is moderately eroded. The soil is Walla Walla silt loam. To cultivate this land with safety, intensive erosion-control measures must be applied. The practices needed are: Stubble mulch; contour cultivation and seeding; strip cropping; field diversions seeded to permanent grass; and a rotation of legumes and grasses for 3 or more years, peas and spring wheat or stubble mulch 1 year, and wheat several years.

Wn-15052

land placed in class III because of stones so large as to interfere with cultivation. Removing stones makes a permanent change in the soil, and the gentle slopes shown in the foreground can thereafter be classified as II.

TH–294; TH–293

Figure 21.—*A*, **Class III land in Hawaii. The soil is Molokai silty clay loam on a 5-percent slope that is severely eroded.** *B*, **An adjoining field, same soil and erosion. The land has been terraced and planted to pineapples.**

Pa-1412

Figure 22.—The land in the foreground is classified as III because large and numerous stones interfere somewhat with cultivation. After the stones are removed the gentler slopes will be reclassified as class II land since they can be farmed safely with a simple system of strip cropping.

R2-210

Figure 23.—Class III land in Georgia. The soil is Appling sandy loam on a 6-percent slope that requires contour cultivation, strip cropping, and terracing to cultivate the land safely.

Land Suitable for Occasional or Limited Cultivation

CLASS IV

Class IV land is suitable for only occasional or limited cultivation. It may be steeper than class III, more severely eroded, more susceptible to erosion, more difficult to drain or irrigate, less fertile, more open and porous and so give excessive permeability, or otherwise less suitable for cultivation than class III land. It is not good land for row crops and is best used for permanent vegetation. Much class IV land in the humid regions may be cultivated occasionally by using a long rotation of a grain crop every 5 or 6 years, followed by several years of hay or pasture. More intensive cultivation is justified only if the farm does not have enough better cropland, and then only for a temporary period until other adjustments can be made, or in time of emergency when a large acreage of crops is needed for a few years. Some of the nearly level imperfectly drained land classified as IV is not subject to erosion but is unsuitable for intertilled crops because of the time required for the soil to dry out in the spring and because of its low productivity when in these crops. In semiarid regions some of the land classified as IV is suitable for cultivation that is limited to the growing of feed crops, provided not more than 320 acres is cultivated in one tract and the surrounding land remains in grass. Such land is not suitable for growing wheat but can be used effectively for livestock ranches.

Figure 24 shows class IV land in an irrigated area. Three examples of class IV land in the humid regions are shown in figure 25.

***Figure 24.*—Class IV irrigated land in Idaho with a 15-percent slope, too steep to be used ordinarily for other than close-growing crops. Perennial legumes and grasses for hay or pasture may be grown, and the land should be cultivated only when perennials are to be renewed.**

SC–1145; La–30002–C; R2–212

Figure 25.—*A*, Class IV land in South Carolina on Cecil sandy loam on a moderately eroded 13-percent slope. An intertilled crop may be grown occasionally as a step toward the renewal of a stand of grass and legumes for permanent pasture. *B*, Class IV land in Louisiana on a 10-percent slope, which on this soil is too steep for safe cultivation. This 3-acre pasture was seeded to a mixture of White Dutch, Hop, Persian, and Black Medic clovers and Bermuda grass. *C*, Class IV land in Georgia. A severely eroded slope planted to kudzu for permanent hay.

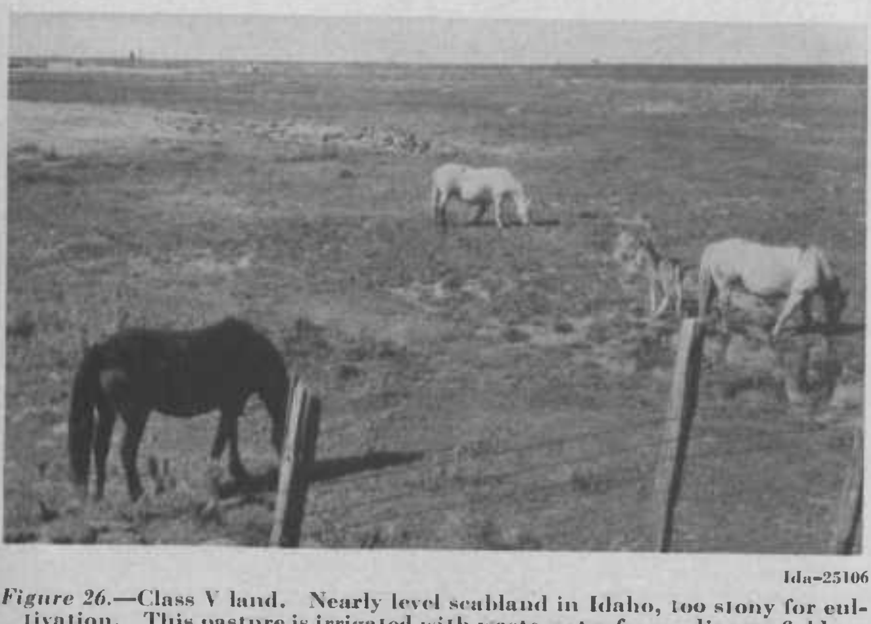
Most of the class IV land in humid regions is well suited for woodland. Unless they are needed for pasture, it is not as a rule desirable to clear areas now covered with trees.

Land Not Suitable for Cultivation but Suitable for Permanent Vegetation

CLASS V

Class V land is not suitable for cultivation but is suitable for permanent vegetation that may be used for grazing or for woodland without any special restrictions. It must be nearly level and not subject to either water or wind erosion, even if the cover should be removed. If the cover is in good condition now, the land requires no special restrictions or special practices for its protection, although certain range-management or woodland-management practices such as stocking within carrying capacity and prevention of burning are always needed to obtain satisfactory production. Land on which vegetation has become temporarily depleted through misuse may require moderate or even severe restrictions for a period of time. If these are solely to permit recovery of vegetation, if the land is not subject to erosion, and if it is capable of producing moderate to high yields of forage or of woodland products, the land would be classified as V regardless of the present kind, amount, or condition of vegetation.

Since land of class V must not be subject to either water or wind erosion and also is not suitable for cultivation, it consists largely of land that is too wet or stony for any cultivation but produces forage or woodland products. No special restrictions or special practices are needed to protect the land, although some restrictions of grazing or

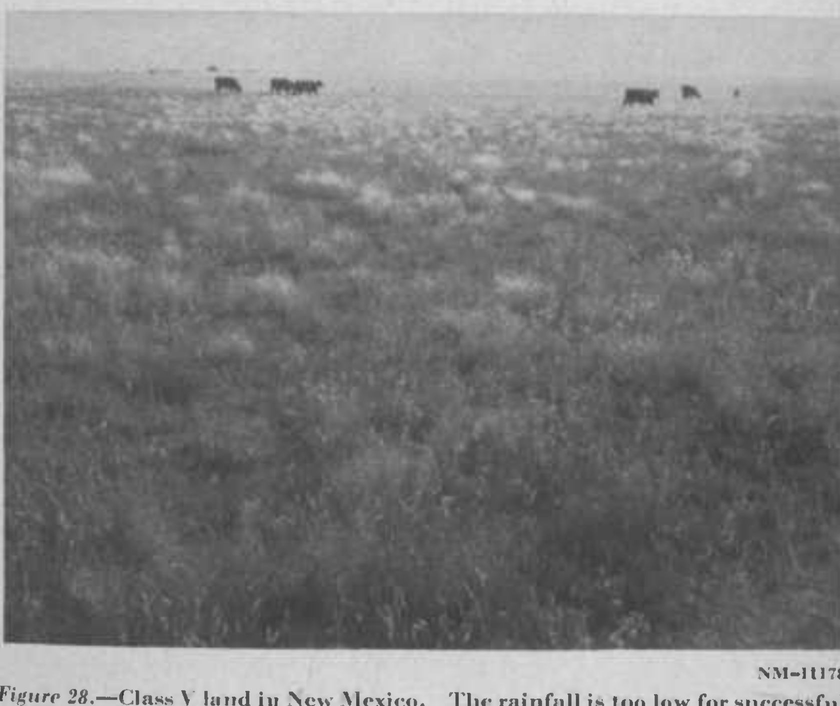


Ida-25106

***Figure 26.*—Class V land. Nearly level scabland in Idaho, too stony for cultivation. This pasture is irrigated with waste water from adjacent fields.**

C-8019

Figure 27.—Class V land (in the foreground) in a mountain valley in Colorado. Locally called "wet meadow," it is too poorly drained to be suitable for cultivation but is excellent for grass and hay. In the background is class VII land that has a droughty, shallow, gravelly soil on a 20-percent slope.



NM-11178

Figure 28.—Class V land in New Mexico. The rainfall is too low for successful production of cultivated crops but is adequate for production of grass vegetation. This land is nearly level, and is deep and fertile and in no appreciable danger of erosion.

timber harvesting may be worth while to improve the yield. Examples of class V in western States are shown in figures 26, 27, and 28. Class V also occurs in many of the swampy areas that cannot be drained, in the Central, Northeastern, and Southern States.

CLASS VI

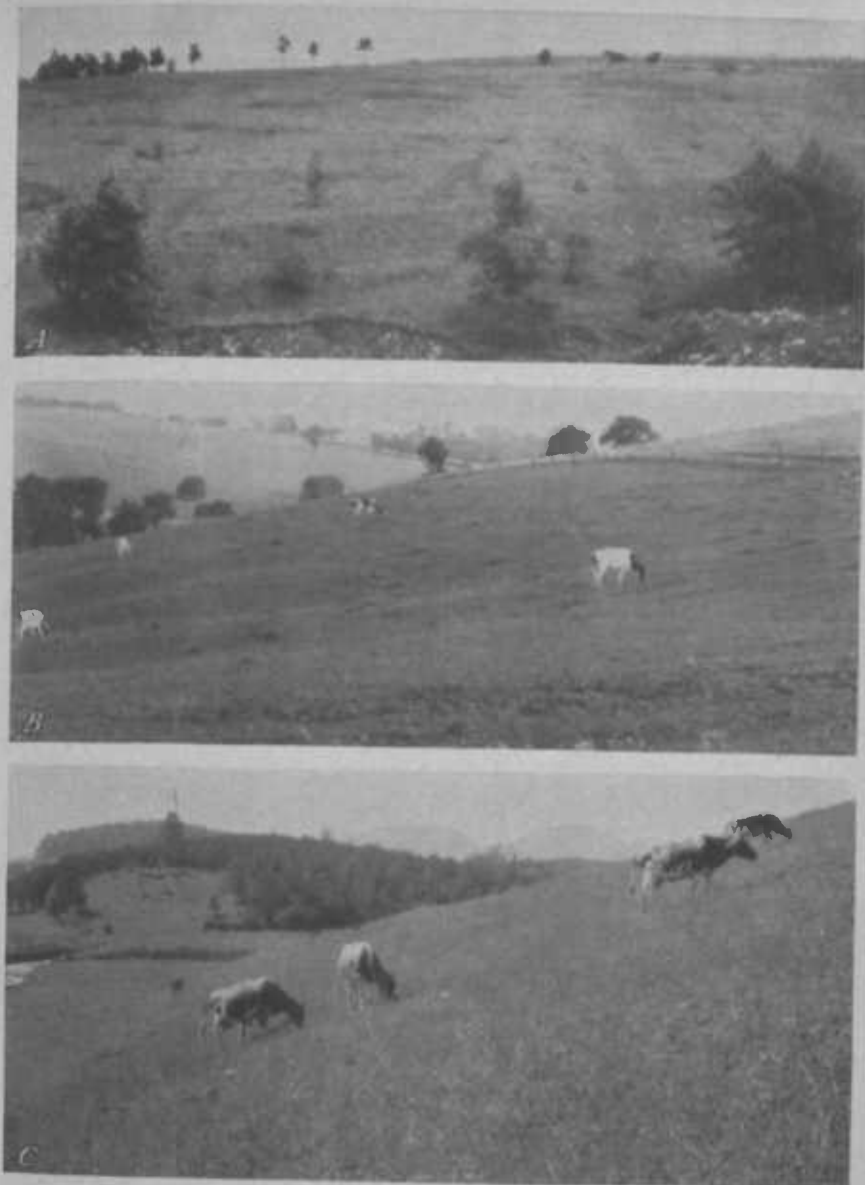
Class VI land is suitable for permanent vegetation that can be used for grazing or for woodland, with moderate restrictions. It is not suitable for cultivation. Most of it either is moderately sloping and therefore subject to water erosion, or is subject to wind erosion. The restrictions commonly needed on range land are chiefly limitation of grazing to the carrying capacity, deferred grazing to permit growth of grass in the spring, and rotation of grazing to permit the grass to recover and form seed. Fencing, distribution of water ponds, salting, and herding are some of the practices necessary to bring about these limitations. Contour furrows, ridges, and water spreaders may be useful to check or divert water and thereby increase the growth of grass.

Land of class VI, capable of producing moderate yields of forage or of woodland products under moderate restrictions, might have the vegetation depleted by mismanagement and therefore might require severe restrictions in use for a few years to permit recovery of vegetation. An example of such temporary severe restrictions would be total exclusion of livestock from overgrazed class VI range land.

Class VI land as a rule is either steeper or more subject to wind erosion than class IV land. It must not be too severely eroded, however, to prevent safe use with moderate restrictions. Not much of it is poorly drained.

Ore–10018

***Figure 29.*—Class VI land in Oregon. A shallow soil on a 20-percent slope. The range on the left of the fence has been under good range management for nearly 3 years and has made marked improvement in the type and amount of forage.**



Wis-539; W Va-10150; NC-D4-31

Figure 30.—*A*, Class VI land in Wisconsin, a shallow soil moderately eroded on an 18-percent slope. Although it is not suitable for cultivation, it will maintain grass if precautions are taken. This field has been limed, fertilized, and seeded. *B*, Class VI land in West Virginia that is too steep and has soils too shallow for cultivation at any time but is suitable for grass with moderate restrictions in use. Lime and fertilizer are needed. *C*, Class VI land in North Carolina. This slope is too steep for safe cultivation, but it is suitable for permanent use as pasture if it is fertilized and if grazing is properly restricted. The field was seeded to a pasture mixture of redtop, orchard grass, bluegrass, and lespedeza, and treated with 1 ton of lime and 200 pounds of superphosphate per acre.

The class VI land shown in figure 29 has a shallow soil on a 20-percent slope. Watering places are not properly distributed, which leads to overgrazing of some areas and undergrazing of others. The practices needed for good range management on this land include utilization of the forage according to grazing capacity, the growth requirements of the desirable plants, and the cover requirements to control soil and water losses; proper seasonal use; rotation grazing; bedding out; open herding; development of springs; location of salt boxes on ridgetops; fences for better distribution of stock; contour furrows; and diversion ditches.

Class VI land in three different locations in humid regions is shown in figure 30. The Wisconsin example (fig. 30, *A*) is a shallow soil on

Colo-7201; Colo-7106

Figure 31.—*A*, Class VI land in the foreground, class VII on the steeper slope. *B*, Land of classes VI and VII near Colorado Springs, Colo. The slope in the foreground is class VI; the rough land is class VII.

an 18-percent slope. It is not suitable for cultivation but will make good pasture if it is limed and fertilized regularly, and seeded when necessary. It received 3 tons of lime and 250 pounds of 20-percent superphosphate per acre and was seeded with a mixture of sweetclover, alfalfa, red clover, and timothy. It was not necessary to seed Kentucky bluegrass as it is present as a volunteer in all pastures in this locality and will be the dominant grass after the land has been pastured a few years. The other two pictures show land suitable for pasture in West Virginia and in North Carolina. The general recommendations are liming, fertilizing, and seeding, but the details such as kind and amount of fertilizer and of the seeding mixture are different for each locality.

Figure 31 shows two examples of class VI land in Colorado, with class VII in the background of each picture. Rainfall is barely adequate to maintain good grass on the class VI land, and contour furrows must be used to save as much of it as possible. Grazing must be restricted also. The class VII land is steeper, has shallower soil, and should be grazed only with severe restrictions. That in figure 30, *B*, produces some timber in addition to forage, but it requires very careful management to maintain adequate cover.

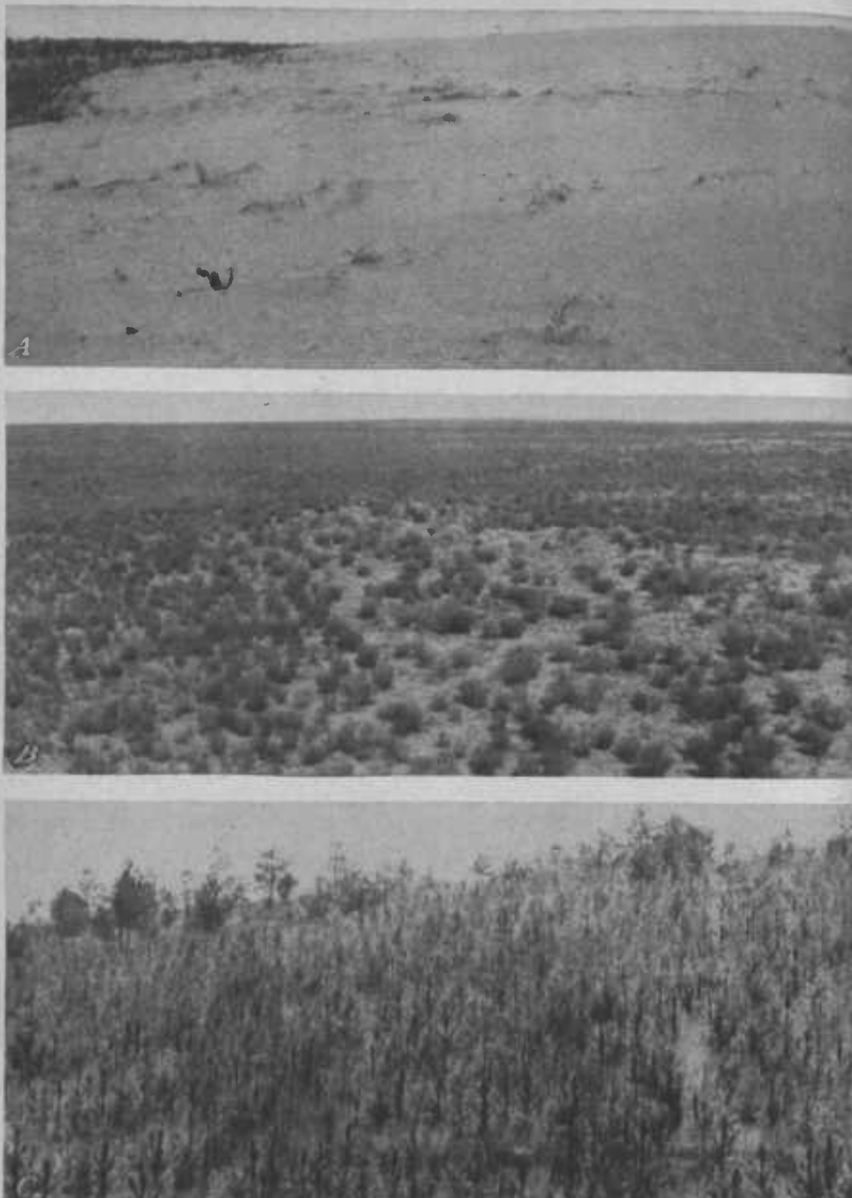
CLASS VII

Class VII land is not suitable for cultivation and requires severe restrictions if it is used for pasture or woodland. Many of the restrictions in use and special practices needed are similar to those used on class VI land, but they must be applied more intensively. Structures such as contour furrows, ridges, and water spreaders are for the most part not applicable on class VII range land. Salting and watering places should not be located on class VII land if there is any class VI land near by.

Pastures in humid regions generally need liberal fertilization and careful regulation of grazing, and many of them need liming and reseeding. Most class VII land in humid regions, however, is recommended for woodland rather than for pasture. Practices recommended for woodland usually include exclusion of livestock, prevention of fire, selection of trees for cutting, avoiding overcutting, and careful harvesting methods with skid trails on the contour if possible. Most of the severely gullied land in humid areas is class VII land and should be planted to trees.

Most land in class VII is steep, rough, eroded, or highly susceptible to wind erosion. All of it, however, must have capability for production of useful vegetation that furnishes woodland products or forage. Arid land affording only sparse annual plants for grazing a few weeks each year, mountain land that might yield some forage but on which any grazing would induce destructive runoff and erosion, and steep sides of rock gorges that support only scattered shrubs and trees would be classified as class VIII land, rather than as class VII.

Examples of class VII land are shown in figures 32, 33, and 34. The Colorado and New Mexico examples (fig. 32, *A* and *B*) are land where low rainfall affects the capability for use. The others are severely eroded, very steep, or extremely stony land.

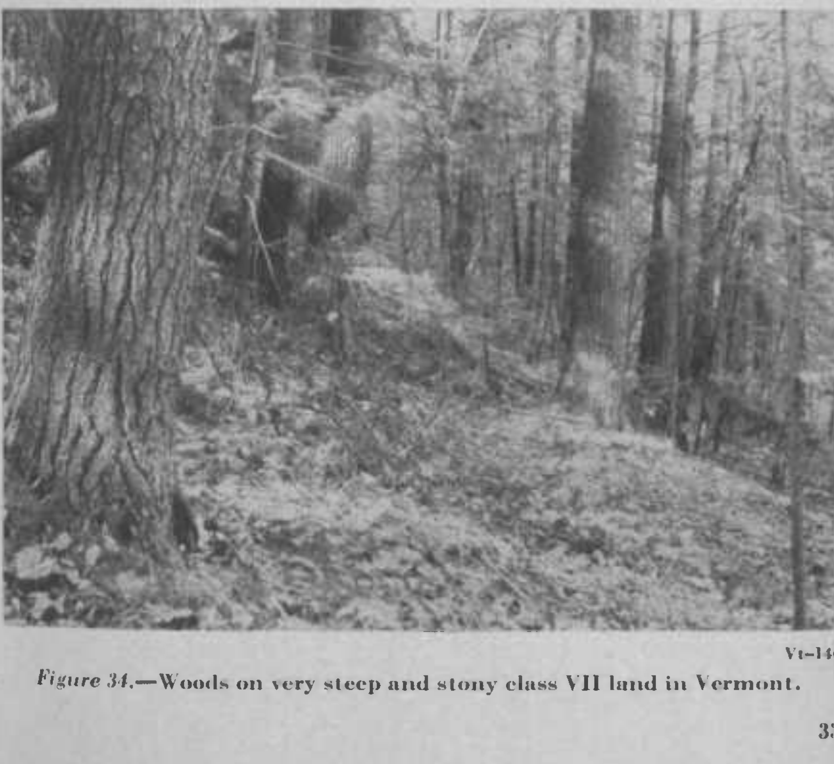


Col–613; NM–9455; Ala–D2–12

Figure 32.—*A*, Class VII land in southeastern Colorado. Because of its extremely sandy nature and the scant vegetal cover obtainable in a region of low rainfall, grazing must be severely restricted. *B*, Class VII land in New Mexico. It is extremely susceptible to wind erosion because the soil is sandy, the rainfall low (about 8 inches annually), and the vegetation sparse. Grazing must be very carefully controlled. *C*, Class VII land in Alabama so severely eroded that it no longer is suitable for cultivation. It will still grow pine trees, although not so well as better land. This land was cleared about 60 years ago. Corn and cotton were grown without protective measures until the land was essentially ruined for cultivation. It was planted to pines 5 years before the photograph was taken.

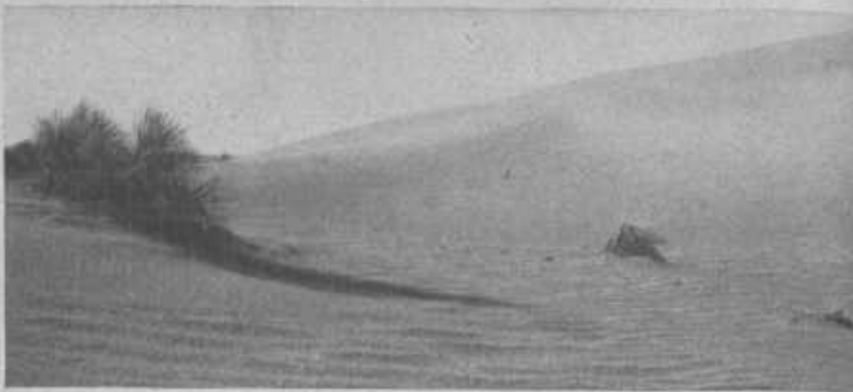
Minn–185

Figure 33.—Class VII land in Minnesota on a 25-percent slope that has been severely damaged by erosion. Trees are being planted with the hope of establishing permanent cover to protect the soil. Not even a tree crop is likely to be very profitable on such land.



Vt–146

Figure 34.—Woods on very steep and stony class VII land in Vermont.



Col-597-A

Figure 35.—**Class VIII land in a sand-hill area in Colorado. This was formerly good grazing land; but because of mismanagement, it is now not only wasteland but also a dangerous menace to adjoining land.**

Land Not Suitable for Cultivation, Grazing, or Woodland

CLASS VIII

Class VIII land is not suitable for cultivation or for the production of useful permanent vegetation that may be harvested under grazing or woodland use. It is chiefly rough, extremely stony, barren land, or swamps and marshes that are permanently wet and cannot be drained. Some of it, particularly the swamps and marshes, may be made to produce a profitable crop of wildlife.

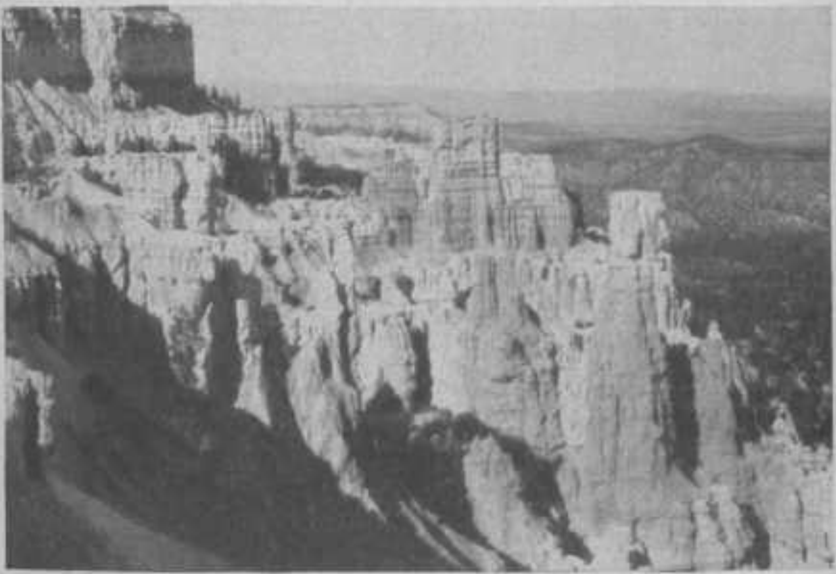
Examples of class VIII land are shown in figures 35 to 38.

SD-10453

Figure 36.—**The South Dakota Badlands are class VIII land. This is wasteland unsuited for cultivation or grazing.**

Pa–100208

Figure 37.—Class VIII land in Pennsylvania. This marsh cannot be drained economically, because the cost of drainage is greater than the return that would be obtained. It is useful primarily for the production of muskrat pelts. With some attention to management, other types of class VIII land can be made to support equally desirable forms of farm and ranch wildlife.



Utah–629

Figure 38.—Class VIII land in Utah.

Using the Physical Inventory

IN THE FOREGOING discussion of the eight land-capability classes no attempt has been made to list or to show by photographs all of the possible sets of conditions in each class. The lists of practices, likewise, are representative but not complete. Decisions about the exact classification must be made by the local committee, in general agreement with the definitions of the classes but expanded to take in all of the soils, slopes, and degrees of erosion occurring in the district. The classification that is finally made must be one that will be useful in bringing about better land use, more conservation farming, and more production.

Many of the factors that affect land capability, such as natural drainage, supply of plant nutrients, and the climate, affect also the productiveness of the land. Others such as slope and erodibility have little direct effect on productivity. The relationship between land-capability classes and a productivity grouping may be fairly close, or there may be little relationship, depending on which factors are dominant. A dark-colored prairie soil on a slope steep enough to be classified as class IV land may be decidedly more productive temporarily—as long as the surface soil lasts—than a light-colored soil on a gentle slope that is in class II. All land in classes I, II, and III, however, must be at least productive enough to give moderate to high yields of some crops without unusual or extreme fertilizing or management practices. To be in one of these three classes, land must be productive enough to make regular cultivation a practical recommendation.

The land-capability classification, once made, is fairly permanent, but changes either in the land or in the methods by which it can be used or protected will make reclassification necessary. Soil erosion, for example, changes the capability of the land almost without exception to a class less suitable for cultivation. Wind erosion can ruin a cultivated field in a single season or even in a few weeks, and water erosion in extreme cases can carve huge gullies in a few hours. A possible need for reclassification might arise if experience demonstrated that certain slopes and soils, formerly believed to be too erodible for cultivation, could be controlled adequately by improved methods. Still other causes for reclassification might be the development of new sources of water for irrigation of arid land, new outlets for draining wet land formerly considered not drainable, or extensive new levees to protect bottom land from overflows that formerly made cultivation impossible.

Choosing Practices to Fit the Land

While the members of the committee of farmers and agricultural workers are summarizing the many combinations of different soil types, slopes, and erosion classes into land-capability classes, they must also study and discuss the practices and measures needed on the land. They talk over and write down the most suitable crops for different kinds of land, the crop rotations that are recommended, the

need for fertilizers, lime, manure, green manure, or other soil improvements, and the many soil-saving and water-saving practices that must be used to protect the cropland. In a similar way they consider the different methods of handling pasture, woodland, or range land. They prepare a table that can be used with land-capability maps as a general guide for conservation farming. Table 2 was prepared for a soil conservation district in South Carolina.

Table 2 is a great deal more than a simple list of crops and practices for each land-capability class. Major differences between groups of soils in class II or class III and to a lesser degree in class I may call for widely different crops, soil management, and soil-conserving practices. Moreover, the choice of many practices or the intensity with which they must be applied depends on the other practices. For example, in southeastern Minnesota it has been found that on light-colored soils having slopes between 3 and 8 percent that are slightly or moderately eroded (class II land), strip cropping and contour cultivation will control soil erosion, provided the crop rotation is a 4-year one that includes at least 2 years of hay. For a 3-year rotation of corn, grain, and hay, however, terraces must be used in addition to strip cropping. Numerous combinations of this kind must be worked out, the need for certain practices depending on the others that are to be used.

Table 2 applies to a section where crop rotations are needed but have not been used very generally in the past, partly because of the emphasis placed on cotton as a cash crop and partly because seed for suitable legumes and grasses was not generally available. There is still a lack of suitable perennial grasses, but legumes such as common lespedeza, sericea lespedeza, crimson clover, cowpeas, soybeans, velvetbeans, and crotalaria are now available and seed for many of them can be grown on the farm. Some of them will make good growth during the winter months and can be planted following intertilled crops. Winter grain is also useful for winter cover. A number of different rotations are suggested in the table, and it is possible that the table can be simplified to some extent after it has been tried out for a few years. Fertilizers are needed for nearly all crops. Terracing for safe disposal of water is needed on nearly all of the sloping land that is used for crops, in both class II and class III. Much of the land in classes IV and VII is severely eroded and needs to have water diverted from gullied areas and also needs good pasture or woodland management. Hay crops, but not intertilled crops or grain, may be grown safely on the class IV land.

The land-capability map and a set of recommendations furnish a simple guide for conservation farming to farmers and agricultural technicians. More information is needed, of course, to make a farm plan. The farmer's resources, his choice of crops, his type of farming, and many economic, social, and personal factors affect the choices that he will make among the possibilities listed in table 2. An experienced farm-planning technician points out some of these alternatives and helps him to select the ones that will best meet his requirements. The combination chosen should allow best possible use of the farmer's land, labor, equipment, and ability as a manager.

TABLE 2.—*Farming and conservation practices recommended, according to use capability of the land, in the Abbeville Soil Conservation District, South Carolina*

Land-capability class	Soils	Practices recommended for [1]—				
		Cropland			Pasture	Woodland
		Crops and rotations [2]	Soil treatments [3]	Supporting practices		
1 (green) [4]	1. Well-drained soils on first bottoms and colluvial slopes.	Especially suitable for corn. 1. C(p)-G(p). 2. C(p)-G(l)-L.	Corn: Side dressing with nitrogen [5] is sufficient if rotation includes cotton or another heavily fertilized crop. If corn is preceded by a legume, 200 to 400 pounds of 0-16-8 or 0-12-12. If not preceded by a legume, 200 to 400 pounds of 4-12-4 or 5-10-5, plus side dressing of nitrogen. If farm manure is used, 200 to 400 pounds of 0-18-0. Cotton: On light soils where average yields are expected, 300 to 400 pounds of 4-12-8, plus side dressing of nitrogen. On high-yielding soils, 300 to 500 pounds of 5-10-5, plus side dressing of nitrogen. If preceded by summer legumes, 300 to 600 pounds of 3-8-8 or 4-8-8. On light soils that give high yields or if potash is deficient, 400 to 600 pounds of 7-7-7. Small grain: Nitrogen alone, if other crops in rotation are fertilized heavily. Otherwise, after plowing under a legume crop, 200 to 300 pounds of 0-16-8 or 0-12-12 plus nitrogen. If not preceded by legumes, 200 to 300 pounds of 4-12-4 or 3-12-8, plus nit- [illegible]	Diversion or control of water from higher land.	New pastures: 200 to 600 pounds per acre of 4-12-4 or 5-10-5. Old pasture sod: 200 to 400 pounds per acre of 0-16-8. Brushing and mowing. Control of grazing. Development of livestock watering facilities. Soil group 3h not very suitable for pasture.	Protection from fire and grazing. Reforestation of available sites, bedding and cultivation for field-planted hardwoods. Fertilizing where needed. Improvement cuttings and spot planting. Regulation of barvest cutting.
	2. Well-drained loams to clay loams: Davidson and Mecklenburg	Best suited to grain and legumes used in livestock farming. Excellent for clovers. 1. Ct-G(l)-G(l). 2. C(p)-G(l)-L. 3. Ct(g)-G(l)-C(p). 4. Ct(g)-G(l or p).				
	3. Well-drained sandy loams: a. Cecil, Georgeville, Lloyd, and Wickham.	Excellent for cotton. 1. Ct(g)-G(l, cr, or p). 2. Ct(lm or g)-Cg-G(l or p). 3. Ct-Ct-G(l)-L. 4. Ct(g)-G(l)-C(p).				
	h. Appling and Durham.	Suitable for crimson clover and other winter legumes, and for commercial truck crops. 1. Ct(g)-G(cr, p, or v). 2. Ct(lm or g)-Ct(g)-G (cr or p). 3. Ct(lm or g)-Ct(g)-G (cr)-C(p).				
II (yellow) [4]	2. Well-drained loams to clay loams: Davidson and Mecklenburg.	Best suited to grain and legumes in livestock farming. Well suited to clovers. 1. Ct-G(l)-G(l). 2. C(v or p)-G(l)-L. 3. Ct(g)-G(l)-C(v or p). 4. Ct(g)-G(l, v, or p).	For corn, cotton, and small grain, same as class I. All rotations to include turning under one soil-improving crop every third year.	Treatment of galled spots. Maintenance of vegetation on field borders and road banks. Diversion of runoff from higher land. Contour strip rotations in large fields of B slope. Contour tillage. Contour listing in winter of fields not protected by vegetation except on soils of group 5. Complete water-disposal system, including terracing and stabilized outlets.	Brushing and mowing. Control of grazing. Liming and fertilizing as needed. Contour furrowing or bedding on some pastures. Development of stock-watering facilities. Preparation of firm seedbed; fertilizing and liming for new pastures.	Same as class I. Reforestation, contour bedding and cultivation for field-planted hardwoods.
	3. Well-drained sandy loams: a. Lloyd, Cecil, Wickham, and Georgeville.	Excellent for cotton. 1. Ct(g)-G(l, p, or cr). 2. Ct (lm or g)-Ct(g)-G(l). 3. Ct-Ct-G(l)-L. 4. Ct(g)-G(l)-C(p).				
	b. Appling and Durham.	1. Ct(g)-G(cr, p, or v) 2. Ct(lm or g)-Ct(g)-G (cr or p). 3. Ct(lm or g)-Ct(g)-G (cr)-C(p).				
	5. Imperfectly drained soils with plastic, tough, or compact subsoils: Helena, Iredell, and Enon.	Suitable for small grain and lespedeza in rotations, and for crimson clover. 1. Ct(g)-G(l, p, or cr). 2. Ct(lm or g)-Ct(g)-G (p). 3. Ct(g)-G(l)-C(p).	Same as soil group 2. Very responsive to potash.	do	do	Same as soil group 2. Not suitable for black locust.
III (red) [4]	2. Well-drained loams to clay loams: a. Loams: Davidson and Mecklenburg.	Best suited to grains and legumes in livestock farming, and clovers. 1. Ct-G(l)-G(l). 2. C(p)-G(l)-L. 3. Ct(g)-G(l)-C(p). 4. Ct(g)-G(l, p, or cr).	All rotations to include turning under at least one soil-improving crop every third year. For corn: Same as classes I and II. For cotton: Same as classes I and II, and also, for heavy soils, 300 to 400 pounds of 4-12-4 plus side dressing of nitrogen: and for high-yielding heavy soils 400 to 600 pounds of 6-8-4. For small grain: Same as classes I and II.	Treatment of galled spots. Stabilization of gullies. Maintenance of vegetation on field borders and road banks. Diversion of runoff from higher lands. Contour strip rotations. Strips of perennial vegetation on critical areas and to break long slopes. Contour tillage. Complete water-disposal system, including terracing and stabilized outlets.	Same as on class II except that more care and closer regulation of grazing may be needed. Soil group 3b not well suited for pastures.	Same as class II, soil groups 2 and 3.
	b. Clay loams: Davidson, Cecil, Mecklenburg, Lloyd; and Georgeville.	Well suited to small grain and perennial legumes. 1. Ct-G(l or cr)-G(l or cr). 2. Ct(g)-G(l, p, or cr).				
	3. Well-drained sandy loams: a. Cecil, Lloyd, Georgeville, and Wickham.	1. Ct(g)-G(l, p, or cr). 2. Ct(lm or g)-Ct(g)-G and L, or G(l). 3. Ct-Ct-G(l)-L. 4. Ct(g)-G(l)-C(p).				
	b. Appling and Durham.	1. Ct(g)-G(cr, p, or v) 2. Ct(lm or g)-Ct(g)-G (cr, p, or v). 3. Ct(lm or g)-Ct(g)-G (cr)-C(p or v).				
	5. Imperfectly drained soils with plastic, tough, or compact subsoils: Helena, Iredell, and Enon.	Suitable for small grain, lespedeza, grass, and crimson clover. 1. Ct(g)-G(l, p, or cr). 2. Ct(lm or g)-Ct(g)-G(l). 3. Ct(g)-G(l)-C(p).	Same as soil group 2. Likely to be deficient in potasb.	do	do	Same as class II, soil group 5.

See footnotes at end of table.

TABLE 2.—*Farming and conservation practices recommended, according to use capability of the land, in the Abbeville Soil Conservation District, South Carolina*—Continued

Land-capability class	Soils	Practices recommended for [1]— Cropland: Crops and rotations [2]	Cropland: Soil treatments [3]	Cropland: Supporting practices	Pasture	Woodland
IV (blue) [4]	2. Well-drained loams to clay loams: Cecil, Davidson, Mecklenburg, Lloyd, and Georgeville. 3. Well drained sandy loams: Appling, Cecil, Durham, Georgeville, Lloyd, and Wickham. 5. Imperfectly drained soils with plastic, tough, or compact subsoils: Enon, Helena, Iredell, and Orange. 6. Soils with little natural development: Goldston, Louisburg, and Wilkes.	Kudzu. Common lespedeza. Sericea lespedeza. These may be grown for hay or temporary grazing with fair results.	On fair to good soils: 200 to 300 pounds of 0–17–8 or 0–12–12. On eroded soils: 200 to 300 pounds of 4–12–4 or 4–16–4.	Stabilization of gullies and galled spots. Diversion of hillside water. Cultivated only when necessary to reestablish hay or pasture and then in alternate contour strips. Complete water-disposal system, terrace ridges entirely covered by vegetation.	Same as class III. Orange soils best used for pasture. For old pastures on soil group 6, 200 to 600 pounds of 0–16–8.	Reforestation of available sites. Protection from fire and grazing. Improvement cuttings and spot plantings. Regulation of harvest cuttings. Suitable trees: Soil groups 2, 3, and 6; loblolly pine, shortleaf pine, and black locust; also red cedar on group 2. Group 5; red cedar, loblolly pine, yellow poplar, and ash. Group 7; ash, sweetgum, and poplar.
	4. Imperfectly drained soils with moderately friable subsoils: Colfax sandy loam.	1. C(p)–G(l or p)	do	do	Same as class III. Best used for pasture.	Do.
	7. Poorly drained soils: Worsham.	None			Same as class III. Suitable for pasture. For new pastures, 200 to 600 pounds of 4–12–4 or 5–10–5.	Do.
V (dark green) [4]	7. Poorly drained soils: Alluvial soils, poorly drained.	None			Cutting of brush. Shallow ditching to remove surface water. Mowing. Control of grazing. Removal of debris from stream channels. Fertilizing with 200 to 400 pounds of 18-percent superphosphate.	Protection from fire. Protection from grazing if reproduction of hardwoods is desired. Controlled grazing permissible when reproduction of pines is desired. Improvement cuttings, conversion cuttings, spot plantings, and regulation of harvest cuttings. Suitable trees: Ash and yellow poplar.
VII (brown) [4]	All soils except group 1	None			Suitable for some temporary grazing or hay production. Best suited for kudzu. Land should be prepared on the contour, fertilized, cultivated until kudzu becomes established, and protected from overgrazing or overcutting. For kudzu, use superphosphate, 200 to 400 pounds per acre on soil groups 2 and 3. On groups 4, 5, 6, and 7, 200 to 300 pounds of 0–17–8 or 0–12–12 if soil is fair to good, or 200 to 300 pounds of 4–12–4 or 4–16–4 on eroded land. Lespedeza may be grown on Iredell, Enon, and Orange soils, with the same fertilizers.	Protection from fire and grazing. On steep slopes, firebreaks should be constructed on ridgetops or approximately on the contour. Improvement cuttings, conversion cuttings, spot plantings, regulation of harvest cutting. Suitable trees: Loblolly pine on all soils. Red cedar on Davidson loam and Mecklenburg loam, and on group 5. Shortleaf pine on Cecil clay and on groups 3, 4, 5, and 6. Black locust on groups 3, 4, and 7. Yellow poplar and sweetgum on group 4.

[1] Practices for hay land and for wildlife areas are not given in the table. All hay land should be prepared with a firm seedbed, fertilized, and limed. Management should include mowing and fertilizing as needed. Some class IV land may need mulching. Water-disposal systems may be needed on classes III and IV.

Wildlife recommendations for all classes include: 1. Borders of shrubs and sericea lespedeza to separate cropland from woodland. 2. Protection of stream banks by shrubs and native herbaceous vegetation—not trees. 3. Farm ponds for fish management on favorable sites. Wildlife is frequently the most economical use of class V land, since fur bearers, waterfowl, and fish provide the chief economic returns from the swamps and marshes in this class.

The production of vegetables in home gardens is recommended for all farm families. Fruit trees and small fruits are also recommended for home use on all farms.

[2] C=corn, Ct=cotton, G=small grain, L=lespedeza, (g)=small grain planted in fall, (p)=cowpeas or soybeans, (l)=lespedeza, (lm)=winter legumes, (cr)=crotalaria, (v)=velvetbeans. All symbols in parentheses indicate crops that are planted in, or that follow, another crop the same year.

[3] All recommendations for fertilizers are those given by the South Carolina Agricultural Experiment Station and Extension Service. Quantities given are pounds of fertilizer per acre. Fertilizer analyses, such as 4–12–4, give the percentages, respectively, of nitrogen, phosphoric acid, and potash.

Lime is also needed on many of the soils in this district. The amount to be applied depends on the soil and crop to be grown and should be determined by test. Overliming should be avoided, especially on sandy soils.

[4] Color distinguishing class area on land-capability maps.

[5] Side dressings of nitrogen on corn or cotton should consist of 100 to 150 pounds of nitrate of soda or an equivalent amount of nitrogen in other forms.

Land-capability maps, as they are ordinarily furnished to soil conservation districts or other work units, show the eight land-capability classes in colors and the physical land factors of soil, slope, and erosion by boundary lines and symbols. Class I land is shown in green, class II in yellow, class III in red, class IV in blue, class V in dark green, class VI in orange, class VII in brown, and class VIII in purple. Hand-colored maps are used in most areas. Several sets of maps have been published. The map on the back cover shows the areas in which surveys had been made, or at least started, and land capability classified, up to May 1, 1942.

Farmers in some soil conservation districts have agreed on certain land use requirements to protect the general community. Control of wind erosion, for example, may be needed over an entire township, since soil blown from the land of one careless farmer may injure the crops or forage belonging to several of his neighbors. Land-capability classes and maps showing them furnish a definite guide for ordinances of this kind.

A Farm Conservation Plan

Some of the methods of using the land-capability classes can be demonstrated by referring to the plan made for an actual farm. A farm of 151 acres, located in Abbeville County, S. C., is shown in figures 39 to 41.

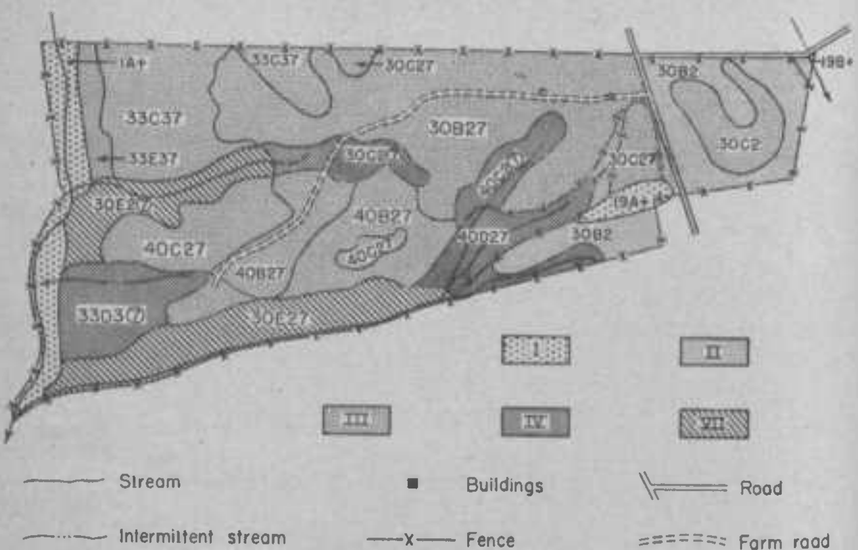


Figure 39.—**Land-capability map of a 151-acre farm containing land of classes I, II, III, IV, and VII. Symbols show the soil types, slopes, and erosion classes. Soils are: 1, alluvial soils, undifferentiated; 19, Seneca sandy loam; 30, Cecil sandy loam; 33, Cecil clay loam; and 40, Appling sandy loam. Slopes are: A, less than 2 percent; B, 2–7; C, 7–10; D, 10–14; E, 14–25; and F, 25 or more. Erosion classes are: +, alluvial land along streams; 2, sheet erosion, 25 to 75 percent of topsoil removed; 27, the same with occasional gullies; 37, sheet erosion, more than 75 percent of topsoil removed, and occasional gullies. A circle around a gully symbol indicates gullies too deep to be crossed with tillage implements.**

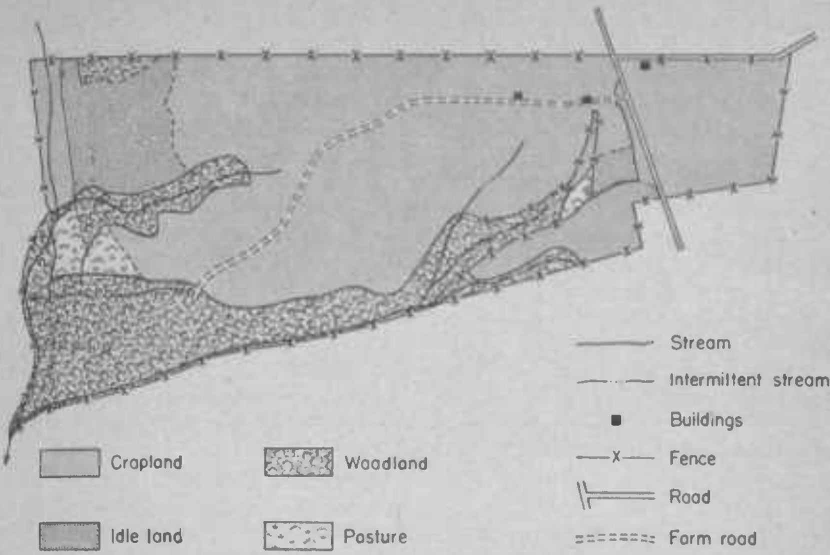


Figure 40.—**Land use on the farm shown in figure 39 before the new farm plan was made.**

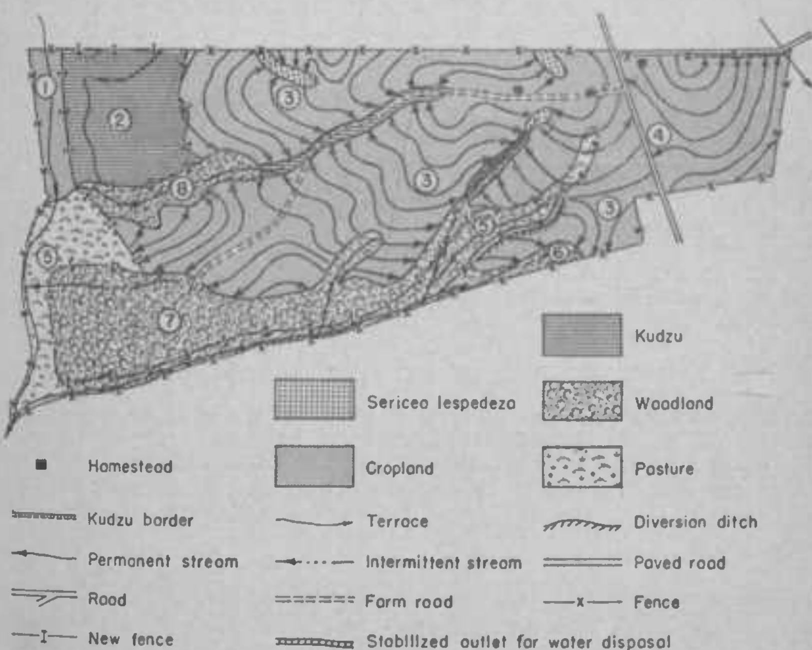


Figure 41.—**Land use in the farm-conservation plan.**

Before the owner of this farm asked the supervisors of the Abbeville Soil Conservation District for help in devising a farm-conservation plan, he was growing about 25 acres of cotton and feed for two mules, two dairy cows, and four young cattle. Crops were grown in large fields that included a great deal of steep and eroded land, as may be seen by comparing figures 39 and 40. There were only 8 acres of permanent pasture, and grazing was permitted in 26 of the 33 acres of woodland.

The same farm rearranged for productive conservation farming is shown in figure 41. Total cropland has been reduced from 101 acres to 95 acres, and field 2, part of which was formerly idle, has been fertilized and planted to kudzu for permanent pasture.

Water control on all the cropland is established by a system of terraces. In addition, a diversion ditch 400 feet long is to be constructed in part of field 3. All terraces and diversion ditches empty into areas of woodland, sericea lespedeza, or kudzu. An outlet ditch stabilized with vegetation is provided for part of the water discharged from field 3. Terraces in field 4 empty into a roadside ditch that is protected by kudzu. All these outlets are to be maintained in vegetation to prevent cutting by the flowing water.

Intertilled crops and grain crops are to be grown in alternate strips in fields 3 and 4. The width of each strip is three terrace intervals in field 3 and two terrace intervals in field 4. These fields are almost entirely class III land, although part of field 4 is Cecil sandy loam, B slope, moderately eroded without any gullies, and is therefore class II land. Most of the class IV land, which is chiefly the deeply gullied areas along the edges of field 3, has been established in permanent cover of kudzu or of trees and shrubs.

A 2-year rotation of cotton or corn and grain followed by lespedeza is to be used on field 3. Corn is to be interplanted with cowpeas. On field 4, which is partly class II land, the rotation is cotton, then grain followed by lespedeza which will protect the land until it is prepared for cotton again the next year.

On field 1, which is class I land, corn will be grown every year. To maintain organic matter, crimson clover will be grown for winter cover. The corn will be interplanted ordinarily with velvetbeans.

The bottom land in the end of field 5 farthest from the buildings will be cleared and used for pasture. It is the only land on the farm not already used for crops that may be plowed with safety when more cropland is needed. The woodland in field 5, consisting of a narrow lane separated from field 7 by a fence, will be used for grazing in order to give stock access to the water and pasture at the far end of the farm. Livestock will be excluded from field 7, and the woodland will be improved by cutting dead and inferior trees to allow good logs to develop rapidly. Shrubs and a strip of sericea lespedeza along the edge of the woodland will furnish food and cover for wildlife.

This new arrangement for conservation farming gives 95 acres of cropland, contrasted with the 107 acres that were formerly in crops or idle. Of this, however, 5 acres are in kudzu, annual lespedeza, or sericea lespedeza to be cut for hay, leaving only 90 acres in intertilled or grain crops. The acreage of cotton remains the same as it

was before, but it is expected that contour tillage and cover crops will give increased yields. The acreages of corn and oats are increased somewhat by making use of the idle land and give more feed for livestock. The amount of hay will be increased from about 11 tons to more than 45 tons, and the pasture is increased from 10 to 22 acres. This will permit a gradual increase in the number of livestock to utilize the extra pasture and feed and will eventually yield additional income from their sale. With increased livestock, more manure will be available for soil improvement.

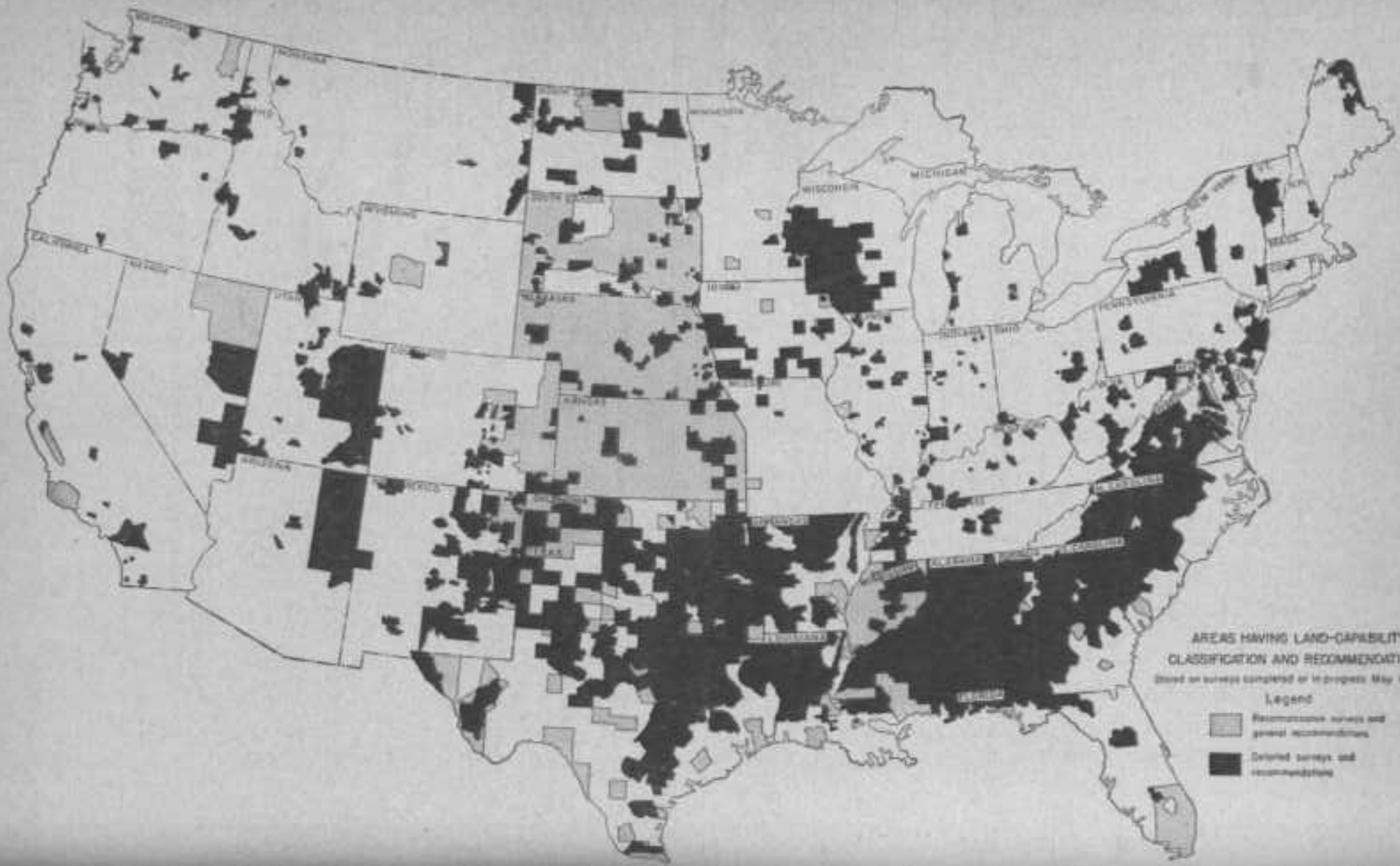
This farm has enough land of classes II and III to provide the necessary crops for a balanced farm enterprise in South Carolina. Its conservation and land use problems are difficult, but they can be solved. Classifying the land according to its capability helped the farmer and the farm planner to see the problems clearly, to understand the needs, capabilities, and limitations of the land, and to use each acre effectively for its contribution to farm income and farm life.

On millions of farms all over the Nation there are land problems to be solved—problems of good land use, of soil conservation, of soil-erosion control. No two farms and no two farmers are exactly alike. For most farms the operator and a farm planner can devise a system of safe and permanent use of the land. Everywhere they need a land inventory; an awareness of the farmer's own resources, his system of farming, and his likes and dislikes; and a sound, practical knowledge of the practices and skills that he can use to hold his soil in place and to use it for a good job of farming. The land inventory will show that many of these farms have enough good land for their needs.

On a few farms the inventory shows that there is not enough land of classes I, II, and III to grow the crops necessary for a profitable, balanced farm business. Planning for conservation farming on these farms is difficult. On many such farms no solution can be found unless additional land can be leased or purchased or a supplementary source of income for the farmer can be established. Here the physical inventory furnishes the facts about the land and enables the farmer to attack his problems with full knowledge of the difficulties involved.

U. S. GOVERNMENT PRINTING OFFICE: 1943

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 10 cents


AREAS HAVING LAND-CAPABILITY
CLASSIFICATION AND RECOMMENDATIONS
(based on surveys completed or in progress May 1942)
Legend
Reconnaissance surveys and general recommendations
Detailed surveys and recommendations
MICHIGAN
WISCONSIN
PENNSYLVANIA
NEW YORK
CALIFORNIA
NEVADA
UTAH
ARIZONA
MONTANA
NEBRASKA
KANSAS
TEXAS
FLORIDA